



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/724,033	11/26/2003	Alexei A. Erchak	16459-008001	7277
23628 7590 01/05/2007 WOLF GREENFIELD & SACKS, PC FEDERAL RESERVE PLAZA 600 ATLANTIC AVENUE BOSTON, MA 02210-2206			EXAMINER WON, BUMSUK	
			ART UNIT 2879	PAPER NUMBER
SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE		
3 MONTHS	01/05/2007	PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

Application No.

10/724,033

Applicant(s)

ERCHAK ET AL.

Examiner

Bumsuk Won

Art Unit

2879

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 29 September 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-4,6-31,33,34,36,38 and 39 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4,6-31,33,34,36,38 and 39 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/30/2006 has been entered.

### ***Response to Arguments***

Applicant's arguments filed on 6/30/2006 have been fully considered but they are not persuasive.

Regarding the argument on pages 9 and 10 of remarks, the Applicant argues that the first layer of Camras is not in contact with a material comprising gas. The Examiner respectfully disagrees. In figure 3A, 5D, 6D, 7A, 7B, 7C, 7D, 7E, 7F, and 8, column 7, lines 25 - column 8, line 23, and column 12, lines 1-7, Camras discloses the first layer 114 being directly contact with air and superstrate 117, and the bonding layers are 126 are optional.

Regarding the argument on pages 10-11 of remarks, the Applicant argues that Camras already has a first layer which is n-type doped. If Camras already anticipates the first layer having n-type doping, the claim is still rejected under 35 USC 102.

Regarding the argument on page 11, the Applicant argues that Lin fails to disclose the first layer is less than 10 microns thick. The Examiner respectfully disagrees. Lin discloses a light emitting device (figure 4) that has semiconductor layers (52, 53, 54) being less than 10 microns (column 4, lines 25-42).

### **Claim Rejections - 35 USC § 103**

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 1-4, 6-20, 22-31, 33, 34, 36, 38 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Camras (US 6,784,463) in view of Krames (US 5,779,924), in further view of Lin (US 6,462,358).**

**Regarding claims 1, 6, 8 and 38,** Camras discloses a light-emitting device, comprising: a multi-layer stack of materials (note figure 2A) including a light-generating region (note figure 2A, item 112), and a first layer (note figure 2A, item 114) supported by the light-generating region, a surface of the first layer being configured so that light generated by the light-generating region can emerge from the light-emitting device via the surface (note figure 2A, item 128) of the first layer; and a material comprising air (note column 12, lines 2-7) in contact with the surface of the first layer, the material having an index of refraction less than about 1.3 (note column 12, lines 5-7, air has refractive index equal to 1), wherein the light-emitting device is packaged (note column 2, lines 37-38, figure 4).

However, Camras does not disclose the first layer is n-doped layer and the thickness of the first layer is less than 10 microns.

Art Unit: 2879

Krames discloses a light-emitting device having a first layer which is n-doped (column 6, line 66 – column 7, line 3), for the purpose of improving the performance of the device (abstract).

Lin discloses a light emitting device (figure 4) having a first layer (54) with a thickness less than 3 microns (column 4, lines 25-42), for the purpose of improving luminous efficiency (abstract).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use n-doped layer disclosed by Krames and to have less than 3 micron thickness first layer disclosed by Lin in the light-emitting device disclosed by Camras, for the purpose of improving the performance of the device.

**Regarding claim 2**, Krames discloses a light-emitting device, wherein the surface of the first layer (note figure 8, item 1 with castle like feature) has a dielectric function that varies spatially according to a pattern (note figure 8). The reason for combining is the same as for claim 1 above.

**Regarding claims 3**, Camras disclose the surface (note figure 2A, item 126a) of the first layer has features with a size of less than about  $\lambda/5$ , where  $\lambda$  is a wavelength of light that can be emitted by the first layer (note column 7, lines 56-58, “500 Angstroms”, the wavelength that is emitted from the LED is between 4000 and 7500 Angstroms, thus, 500 Angstrom is less than 1/5 of the wavelength that is emitted from the LED).

**Regarding claim 4**, Camras discloses the light-emitting device is in the form of a packaged die (note column 2, lines 37-38, and figure 4, item 130).

**Regarding claim 7**, Camras discloses all of the claimed limitations except for the pressure of the gas is less than about 100 Torr.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a pressure of the gas being less than about 100 Torr in the light-emitting device disclosed by Camras, for the purpose of using the light-emitting device in an application which requires specific gas pressure.

**Regarding claim 9**, Camras discloses the packaged light-emitting device is free of an encapsulant material (note column 13, lines 38-41).

**Regarding claim 10**, Camras disclosed the light-emitting device comprising, in part, a cover (note figure 2A, item 117), the material (note figure 2A, item 126a) having an index of refraction of less than about 1.3 (note column 12, lines 5-7, air has refractive index equal to 1) being between the cover and the surface of the first layer.

**Regarding claim 11**, Camras discloses the cover comprises a phosphor material (note column 14, lines 33-40).

**Regarding claim 12**, Camras discloses the cover is configured so that light generated by the light-generating region that emerges via the surface of the first layer can interact with the phosphor material, and so that light that emerges via the surface of the first layer and interacts with the phosphor material emerges from the cover as substantially white light (note column 14, lines 13-19, 29-40).

**Regarding claim 13**, Camras discloses the light-emitting device of claim 1, further comprising: a first sheet (note figure 2A, item 117) comprising a material that is substantially transparent to light that emerges from the light-emitting device (note column 2, lines 55-57); and

Art Unit: 2879

a second sheet (note figure 2A, coated on top of item 117, column 14, line 33) comprising a phosphor material, the second sheet being adjacent the first sheet (note column 14, lines 33-40), wherein the material having an index of refraction of less than about 1.3 (note column 12, lines 5-7) is between the first sheet (note figure 2A, item 117) and the surface of the first layer (note figure 2A, item 126b).

**Regarding claim 14,** Camras discloses the first (note figure 2A, item 117) and second sheet (note figure 2A, coated on top of item 117, column 14, line 33) being configured so that light generated by the light-generating region that emerges via the surface of the first layer can interact with the phosphor material, and so that light that emerges via the surface of the first layer and interacts with the phosphor material emerges from the second sheet as substantially white light (note column 14, lines 13-19, 29-40).

**Regarding claim 15,** Camras discloses a support (note figure 4, item 130) that supports the multi layer stack of materials (note figure 4).

**Regarding claims 16 and 31,** Camras discloses a layer of reflective material (note figure 4, item 118) that is capable of reflecting at least about 50% of light generated by the light-generating region that impinges on the layer of reflective material (note column 6, lines 35-41), the layer of reflective material being between the support (note figure 4, item 130) and the multi-layer stack of materials (note figure 4).

**Regarding claim 17,** Camras discloses the reflective material (note column 6, lines 35-41, and figure 4, item 118) is a heat sink material (note column 6, lines 19-23, "aluminum").

**Regarding claims 18-20,** Camras discloses the heat sink material (note figure 4, item 118) is configured so that the heat sink material has a vertical heat gradient during use of light-emitting device (note figure 4, the heat generated from the light-emitting region (112) will conduct heat vertically through the heat sink material (118) so that the heat conducts to support (130).) Camras also discloses that the heat sink material (note figure 4, item 118) is disposed adjacent the support (note figure 4).

**Regarding claims 22-23,** Camras discloses electrical contacts (note figure 1, items 18 and 20) configured to vertically inject electrical current into the light-emitting device (note column 1, lines 52-56).

**Regarding claims 24-25,** Camras discloses the light-emitting device is light-emitting diode (note column 1, lines 36-41).

**Regarding claim 26,** Camras discloses the light-emitting device is flat surface-emitting LEDs (note figure 7a and 7c has flat surface on the light-emitting or viewer side).

**Regarding claim 27,** Krames disclose a pattern with an ideal lattice constant and a detuning parameter with a value greater than zero (note column 4, lines 22-27, and figures 5a-5c). The reason for combining is the same as for claim 1 above.

**Regarding claims 28-30,** Krames discloses the pattern does not extend into the light-generating region (note figure 3A, item 112) (note figure 3A), the pattern does not extend beyond the first layer (note figure 7c), or the pattern extends beyond the first layer (note figure 10). The reason for combining is the same as for claim 1 above.

**Regarding claim 33,** Krames discloses the pattern is a non-periodic pattern (figure 5b). The reason for combining is the same as for claim 1 above.



**Regarding claim 34**, Krames discloses the pattern is a complex periodic pattern (figure 5c). The reason for combining is the same as for claim 1 above.

**Regarding claim 36**, Camras discloses the first layer (figure 2A, 114) is formed directly on the light-generating region (112).

**Regarding claim 39**, Krames discloses the surface of the first layer is roughened (figure 1). The reason for combining is the same as for claim 1 above.

**Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Camras (US 6,784,463) in view of Krames (US 5,779,924), in further view of Lin (US 6,462,358), in further view of Huang (US 2004/0043524).**

**Regarding claim 21**, Camras in view of Krames, in further view of Lin discloses all of the claimed limitations except for a current spreading layer being located between the first layer and the light-generating region.

Huang discloses a current spreading layer (note figure 2A, item 60) being located between the first layer (note figure 2A, item 70) and the light-generating region (note figure 2A, item 40).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have a current spreading layer between the first layer and the light generating region disclosed by Huang in the light-emitting device disclosed by Camras in view of Krames, in further view of Lin, for the purpose of increasing current flow for brighter light emission.

***Contact information***


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bumsuk Won whose telephone number is 571-272-2713. The examiner can normally be reached on Monday through Friday, 8:00 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar Patel can be reached on 571-272-2457. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Bumsuk Won  
Patent Examiner



**JOSEPH WILLIAMS**  
**PRIMARY EXAMINER**